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Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1988 and predictions for 1989

F.J. Emond and H.F. Cerezke

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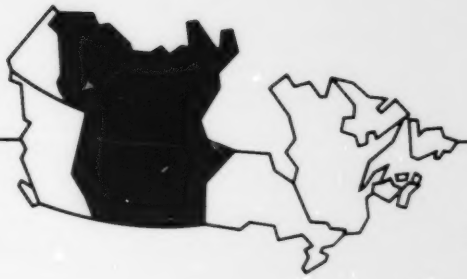

Cover photo: Adult and larval galleries of the bark beetle, *Ips tridens* (Mann.), on Engelmann spruce.

FOREST INSECT AND DISEASE CONDITIONS IN ALBERTA, SASKATCHEWAN, MANITOBA, AND THE NORTHWEST TERRITORIES IN 1988 AND PREDICTIONS FOR 1989

F.J. Emond and H.F. Cerezke

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ABSTRACT

Forest pest conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories during 1988 are summarized and some predictions of infestation status are given for 1989. Nine major pests are discussed, and additional noteworthy insects, diseases, and tree damage agents are reported in a table. Results of surveys for acid rain symptoms and pests and damage incidence in nurseries and plantations are also reported.

RESUME

Les auteurs présentent un résumé de la situation relative aux insectes et aux maladies observés dans les forêts de l'Alberta, de la Saskatchewan, du Manitoba et des Territoires du Nord-Ouest en 1988 en plus de formules certaines prévisions pour 1989. Neuf ravageurs important sont examinés, et les données sur d'autres insectes, maladies et agents de destruction des arbres dignes de mention sont présentées dans un tableau. Des détails sont également donnés sur les résultats de relevés portant sur les symptômes reliés aux pluies acides et sur les agents nuisibles et l'incidence des dommages dans les pépinières et les plantations.

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NOTE

The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by Forestry Canada.

INTRODUCTION

This report summarizes forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, the Northwest Territories, and the Rocky Mountain national parks in 1988 and provides some predictions of infestation levels for 1989. Within the region, survey detection, monitoring, and recording functions were accomplished by Forest Insect and Disease Survey (FIDS) staff at the Northern Forestry Centre (NoFC) of Forestry Canada in cooperation with personnel from the following federal, provincial, municipal, and industrial agencies:

Agriculture Canada
Alberta Environment
Alberta Agriculture
Alberta Department of Forestry, Lands and Wildlife
Northwest Territories Renewable Resources
Manitoba Agriculture
Manitoba Department of Natural Resources
Canadian Parks Service
Saskatchewan Agriculture
Saskatchewan Parks, Recreation and Culture
Provincial parks
Major forest industries
Major urban parks departments

In addition, much of the annual planning and review of regional survey requirements is accomplished through discussions with representatives acting on behalf of many of the above agencies. The cooperation and contributions provided by these agencies are gratefully acknowledged.

Appreciation is also extended to FIDS staff at Forestry Canada headquarters for overall coordination, to FIDS staff in the adjacent provinces of British Columbia and Ontario for additional information along provincial boundaries, and to Forestry Canada staff of the FIDS Technology Development Project at the Petawawa National Forestry Institute for FIDS data management and training services.

In 1984–85 the federal government entered into forestry development agreements with the provinces of Manitoba, Saskatchewan, and Alberta. Provision was made under each agreement to support insect and disease survey services, which have enhanced the FIDS program in each province. We acknowledge the contributions provided by those directly involved under these agreements, namely Peter Amirault (Edmonton) and Marilyn Daoust-Savoie (Winnipeg).

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The pests reported are arranged more or less according to national and regional importance. Comments on other noteworthy insects, diseases, and other tree damaging agents appear in tabular form at the end of the report.

SPRUCE BUDWORM
Choristoneura fumiferana (Clem.)

Spruce budworm infestations increased significantly in size and intensity in Alberta and Manitoba and slightly in the Northwest Territories; infestations remained at approximately the same level in Saskatchewan (Fig. 1). In 1988, the majority of the infestations occurred in spruce stands in the same areas as in the previous year and covered a total area of 137 821 ha compared to 67 820 ha in 1987 (Table 1). Several small-scale control operations were exercised for control of the spruce budworm using the biological insecticide, *Bacillus thuringiensis*. Areas treated were Big Knife Provincial Park (100 ha) and a small private woodlot near Millet (50 ha) in Alberta and some 1000 ha of recreational spruce–fir forests in eastern Manitoba.

In **Alberta**, approximately 650 ha of moderate-to-severe defoliation of mature white spruce was reported in the Grande Prairie Forest along the banks of the Peace River north of Eaglesham. In the Footner Lake Forest, a marked increase in the total area of defoliation was evident in white spruce stands in the Chinchaga River area west of High Level. Light and moderate defoliation was reported over a total area of 61 050 ha compared to 9480 ha reported in 1987. The infestation in the Chinchaga River area was surveyed aerially by the Alberta Forest Service, and ground monitoring was a cooperative undertaking by Forestry Canada and the Alberta Forest Service under the Canada–Alberta Forest Resource Development Agreement.

In the Lac La Biche Forest, approximately 200 ha of light and moderate defoliation was reported in white

Figure 1. Areas of moderate-to-severe defoliation by the spruce budworm in 1988.

Table 1. Summary of spruce budworm defoliation sketch-mapped from aerial and ground surveys in 1987 and 1988

Area	Area of defoliation (ha)		
	1987	1988	Change
Alberta	9 480	61 050	+51 570
Saskatchewan	31 600	31 600	0
Manitoba	15 540	30 821	+15 281
Northwest Territories	11 200	14 350	+3 150
Total	67 820	137 821	+70 001

spruce near the confluence of the Athabasca and House rivers.

Light defoliation was reported in Big Knife Provincial Park and along the northeast boundary of Red Lodge Provincial Park in the central part of the province.

In **Saskatchewan**, spruce budworm infestation levels remained fairly static in the outbreak areas previously reported in the east-central part of the province. The overall total area of defoliation reported in 1988 remained unchanged from 1987 at 31 600 ha (Table 1).

In the Porcupine Hills infestation south of Hudson Bay, moderate-to-severe defoliation persisted in mature white spruce stands in the general area bordered by Eldridge Lake, Tall Pines, Mann Lake, Usherville, and McKinnon, Decorby, and White lakes. West of this main infestation, similar defoliation was reported in two other separate spruce areas, one bordered by the Piwei River and Eagle, Jim, and Arp lakes and the other by Big Valley, Weldon, and Kotoss lakes. The overall area defoliated in all infestations totaled 16 600 ha.

In the Red Earth outbreak area, infestation levels remained much the same as reported for 1987 when a total area of 15 000 ha of white spruce was damaged. Moderate-to-severe defoliation was reported in the area northwest of the Carrot River and south of Highway 55 to the Pasquia Hills. Timber harvesting is continuing in most of the infestation areas to salvage damaged trees.

In **Manitoba**, a significant increase in the size of areas defoliated by the spruce budworm was reported in 1988. Varying degrees of injury to white spruce–balsam fir forests were mapped over a total area of 30 821 ha compared to the 15 540 ha reported in 1987 (Table 1). Most of the spruce budworm infestations continued in the southeastern part of the province. Moderate and severe defoliation was especially notable in Whiteshell Provincial Park and near Lake Wanipigow in the Lake Winnipeg East Forest Section. Light defoliation was present throughout the remainder of the general infestation area. The total overall areas of light, moderate, and severe defoliation in 1988 by Provincial Forest Sections were as follows:

Lake Winnipeg East	29 785 ha
Interlake	1 036 ha
Total	30 821 ha

In the **Northwest Territories**, the spruce budworm infestation that has been present along the Liard River for several years continued to cause varying degrees of injury in approximately the same area as in 1987. A combined total of 14 350 ha of noticeable defoliation was mapped in 1988 (Table 1, Fig. 1). Light-to-moderate injury was again evident in white spruce stands from near the confluence of the Martin and Mackenzie rivers and south along the Liard River valley to the British Columbia border. Scattered patches of moderate-to-severe defoliation were reported in the vicinities of Pointed Mountain and Fisherman's Lake and for a short distance up the Kotaneelee River valley. Light defoliation was evident in the spruce areas where most of the major tributaries, such as the Petitot, Muskeg, Blackstone, and Nahanni rivers, enter the Liard. In the Slave River outbreak the overall area of defoliation expanded slightly from the previous season. In 1988, the total land area affected was 3150 ha compared to 2600 ha in 1987. Light-to-moderate budworm defoliation was evident in white spruce stands on Long Island and along the adjacent shoreline. In this area both white and black spruce were affected. Patches of light-to-moderate defoliation were also reported along the Slave River north of Fort Smith near the mouth of the Salt River. Light defoliation was evident in a small infestation near Hook Lake.

Table 2. Number of spruce budworm moths captured in pheromone traps, percent defoliation, and egg-mass counts in 1988 and predicted defoliation for 1989

Location	Avg. no. moths per trap	Percent defoliation	Avg. no. egg masses per 10 m² foliage	Predicted defoliation for 1989[a]
ALBERTA				
Thickwood Hills	0.3	0	0 (5)[b]	Nil
Fort McKay	0.0	0	0 (0)	Nil
Steen River	11.0	3	0 (13)	Light
Chinchaga River	1442.0	54	65 (195)	Moderate
Hutch Lake	4.0	6	0 (4)	Light
Senex Creek	1.0	1	0 (0)	Light
Freeman River	1.0	0	0 (0)	Nil
Little Smoky River	0.7	0	0 (0)	Nil
Fox Creek	1.0	0	0 (5)	Nil
Nordegg	1.5	0	0 (0)	Nil
Clearwater River (western Alberta)	1.0	0	0 (0)	Nil
Jct. Clearwater and Christina rivers	1.0	0	0[c]	Nil
House River	0.0	29	53[c]	Moderate
Two Lakes Recreation Area	0.3	0	0[c]	Nil
SASKATCHEWAN				
Green Lake	5.0	1	0[c]	Nil
Big River	1.0	1	0[c]	Nil
Montreal Lake	0.0	0	0[c]	Nil
Hudson Bay	4.0	5	4[c]	Light
Usherville 1	1.0	60	126[c]	Moderate-to-severe
Usherville 2	—[d]	65	119[c]	Moderate-to-severe
MANITOBA				
Birds Hill Prov. Park	40.0	18	8 (0)	Light
Spruce Woods Prov. For.	122.0	18	12 (25)	Light
Duck Mt. Prov. Park	3.0	10	0 (0)	Nil
Red Deer River	2.0	4	0 (0)	Nil
Riding Mt. Natl. Park	0.0	3	0 (0)	Nil
Northwest Angle Prov. For.	213.0	3	16 (0)	Light
Whiteshell Prov. Park	612.0	52	346 (200)	Severe
Wanipigow	431.0	49	201 (75)	Severe
Hecla Island Prov. Park	15.0	3	8 (6)	Light
Lake St. George	6.0	3	24 (2)	Light-to-moderate
Rocky Lake	2.0	3	0 (0)	Nil
Simonhouse	1.0	2	0 (0)	Nil
Pisew Falls	0.0	1	0 (0)	Nil

[a] Based upon egg-mass density.
[b] Values in brackets are for 1987.
[c] New trap site in 1988.
[d] Indicates no data available.

Table 2 shows the number of spruce budworm moths captured in pheromone traps, percentage defoliation, and egg-mass counts in 1988 and the predicted defoliation for 1989 for Alberta, Manitoba, and Saskatchewan.

FOREST TENT CATERPILLAR
Malacosoma disstria Hbn.

The forest tent caterpillar was the major defoliator of trembling aspen in the prairie region in 1988. It was responsible for defoliation covering a land area of 18 543 036 ha compared to 7 865 103 ha in 1987. A marked increase in the size of infestations was reported in all three prairie provinces. Most of the infestations continued within the agricultural and marginal agriculture zones in Alberta and Saskatchewan; in Manitoba the significant increase occurred in the forested area (Fig. 2). The estimated areas of trembling aspen defoliated stands are given in Table 3.

Table 3. Summary of moderate-to-severe defoliation of trembling aspen by the forest tent caterpillar in 1988

Province	Area mapped (ha)	Estimated aspen defoliation (ha)
Alberta	18 830 000	2 766 000[a]
Saskatchewan	4 660 200	932 040[a]
Manitoba	52 836	52 836
Total	18 543 036	3 750 876

[a] Estimated as 20% of the total area mapped.

In **Alberta**, the overall land area of moderate-to-severe aspen defoliation increased to 13 830 000 ha in 1988 from 6 610 700 ha in 1987. This is an increase of over 100%. Within this total land area, moderate-to-severe defoliation was estimated at 2 766 000 ha. Most of the defoliation was again present throughout the agricultural zones, although considerable infringement on the aspen forest regions was reported. The main outbreak area was along the Saskatchewan border between Grande Centre and Provost and from this point west to the Red Deer and Rocky Mountain House areas, northwest to Edson, north to Faust, along the south shore of Lesser Slave Lake to the town of Slave Lake, and southeast to Grande Centre. Moderate and severe defoliation of trembling aspen was also reported in the Grande Prairie and Fairview areas in northwestern Alberta, where an estimated 149 186 ha of injury occurred. A small infestation of the same degree was reported within and on the north side of Waterton Lakes National Park and in the vicinity of Beauvais Lake Provincial Park in southwestern Alberta. Numerous reports of probable virus-infected larvae and pupal predation, probably by the flesh fly (*Sarcophaga aldrichi* Park.), were received from the Edmonton–Pigeon Lake area and in the Grande Prairie area.

In **Saskatchewan**, trembling aspen was defoliated over an area of 4 660 200 ha (Table 3), a marked increase from the 1 250 000 ha reported in 1987. Although a large portion of the defoliated aspen stands remained within the agricultural zones as reported in the previous season, a further extension of the infestations into forested areas was evident in 1988 (Fig. 2). Within the total infestation area, actual aspen defoliation was estimated at 932 040 ha; 250 000 ha were reported in the previous season. In western Saskatchewan, moderate-to-severe defoliation was present from Meadow Lake Provincial Park south along the Alberta border to Macklin, east to Wilkie and Speers, and north to Dore Lake. Within this general outbreak area, extensive severe defoliation was most evident in Meadow Lake Provincial Park, near Cowan and Green lakes, and in the North Battleford area. Throughout the remainder of this outbreak, defoliation was predominantly moderate-to-severe. In eastern Saskatchewan, the most extensive area of moderate-to-severe injury extended from the Fort a là Corne Provincial Forest–Smeaton region east to Squaw Rapids, southeast to Hudson Bay, and west along the southern part of the Pasquia Hills to Tobin Lake. A somewhat smaller outbreak of moderate-to-severe defoliation was evident southeast of Greenwater Lake Provincial Park. It extended eastward to the Endeavour, Reserve, and Swan Plain regions. Small, scattered pockets of moderate-to-severe defoliation were noted in the following general areas: Prince Albert, Wadena, Watson, Naicam, near Montreal and White Swan lakes, east of Madge Lake in Duck Mountain Provincial Park, and along the north boundary of Prince Albert National Park near Wabeno Lake (Fig. 2).

In **Manitoba**, a marked increase in the area of aspen defoliation was evident in areas where infestations occurred in 1987. In total, 52 836 ha of moderate-to-severe damage was reported in 1988 (Table 3) compared to 4403 ha in 1987. Infestations increased in size and intensity mostly in The Pas–Flin Flon–Snow Lake triangle and also near Wabowden, Jenpeg, along Highway 6 south of Ponton, along the south shore of Dawson Bay, at several scattered locations in the

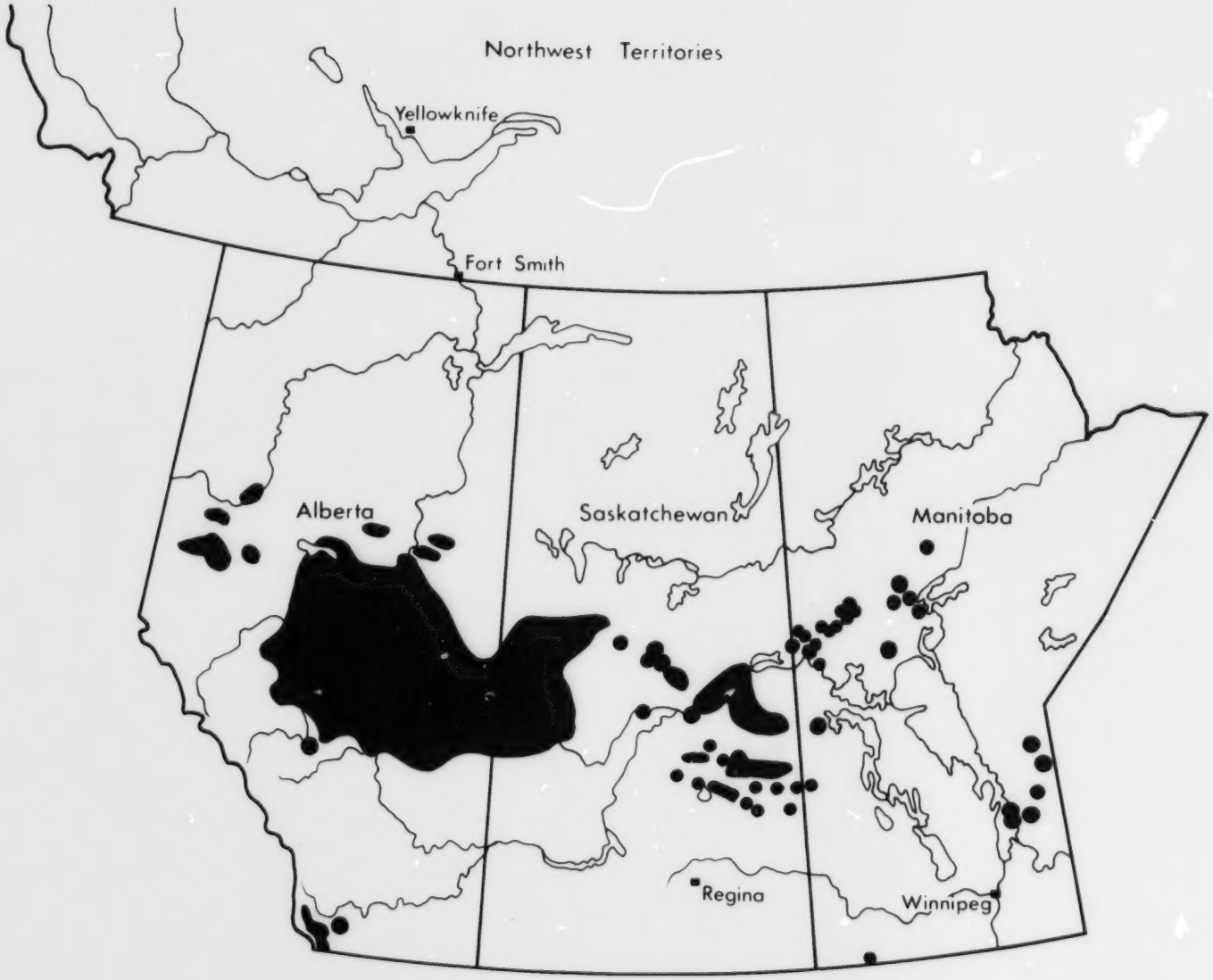

Figure 2. Areas of moderate-to-severe defoliation by the forest tent caterpillar in 1988.

eastern part of the province, and in the Turtle Mountains (Fig. 2).

Egg-band surveys were carried out in the three provinces in the late fall of 1988, and results suggest that the forest tent caterpillar will again cause moderate and severe defoliation in Alberta and Saskatchewan and that there will be increased activity and defoliation in Manitoba (Fig. 3).

MOUNTAIN PINE BEETLE
Dendroctonus ponderosae Hopk.

In **Jasper National Park** there was no evidence of the mountain pine beetle in 1988. The previously reported beetle activity west of the park in Mt. Robson Provincial Park has been monitored by the B.C. Forest Service, and all suspect and beetle-attacked trees were either removed or destroyed.

In **Banff National Park**, where a small infestation of the mountain pine beetle was reported in 1987 along the Spray River, all of the infested trees were cut and burned by Parks Canada personnel. No evidence of beetle-attacked trees was observed in the same location during aerial surveys in 1988; however, a few 1988-attacked trees were observed by the Alberta Forest Service on semiochemical-baited trees adjacent to Spray Lake and at Upper Kananaskis Lake. All successful attacks were hand removed without tree removal, and no tree mortality was observed. A total of 30 semiochemical baits were placed at 10 sites with 3 baits per site.

In **Waterton Lakes National Park**, new and recently killed (newly faded) lodgepole pine were still occurring either singly or as small groups of two or three. The attacked trees were reported in scattered locations along the Cameron Lake and Red Rock Canyon roads. Similar current beetle activity was evident at several locations along both sides of Chief Mountain road through to the Chief Mountain Customs Port. No extensive areas of current beetle injury were evident within the park.

In **Yoho National Park**, small scattered groups of beetle-killed pine were observed along both sides of the Emerald River, south of Emerald Lake, at several locations on the southeast slopes of Mt. Burgess, and in the Mt. Dennis area near Boulder Creek. Small pockets of previously killed pine were evident along Hamilton Ridge and along Tocher Ridge south of the Amiskwi River (Fig. 4).

In **Kootenay National Park**, new infestations (1987 attacks) of the mountain pine beetle appeared to be similar to those reported in 1987 (Table 4). Scattered patches of beetle-killed lodgepole pine occurred along the north slope of Mt. Sinclair, west of Settler's Road, along Swede Creek in Sinclair Pass, and near Radium. Smaller, scattered patches of newly faded trees were evident in and around Redstreak Campground, on Redstreak Mountain, and along both sides of Kimpton Creek. An estimated 1000 trees were newly killed between Radium and Settler's Road. In the area along the east side of the Kootenay River and extending from the south end of the Park to Mt. Selkirk, an additional estimated 2800 newly faded trees were mapped in about 70 patches of infested trees. About 20 of these patches, each with up to 200 dead trees, occurred along the lower slopes of Mounts Daer and Selkirk, while the major infestation continued between Daer and Pitts creeks. No northward spread from Mt. Daer was apparent; however, several small patches of dead lodgepole pine were observed along the south slope of Mt. Wardle and along Dolly Varden Creek. These were attributed to porcupine damage.

Table 4. Estimated number of lodgepole pine trees killed by the mountain pine beetle in the Rocky Mountain national parks, surveyed in 1988

National park	Estimated no. trees killed 1987	1988
Jasper	0	0
Banff	25	0
Waterton Lakes	220	60
Yoho	105	108
Kootenay	3870	3800

Aerial and ground surveys were conducted in southwestern Alberta within the southern Bow–Crow Forest. No beetle-killed lodgepole or limber pine were observed.

DUTCH ELM DISEASE
Ceratocystis ulmi (Buis.) C. Moreau

In **Alberta**, detection surveys for DED and its vectors were conducted jointly by Alberta Agriculture (Alberta Special Crops and Horticultural Research Centre) and FIDS (NoFC) in southern Alberta. Pheromone-baited traps and elm trap logs were set out at

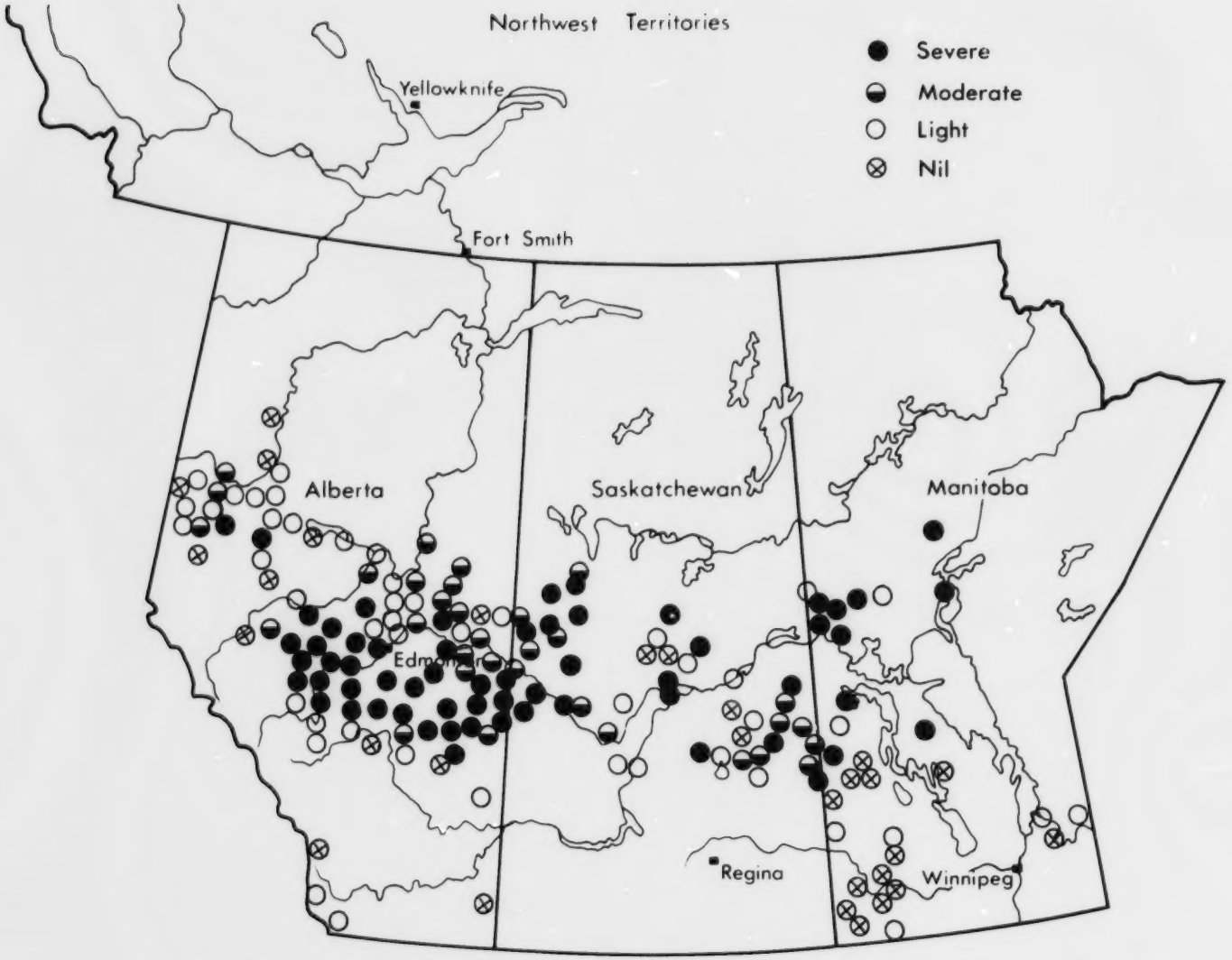

Figure 3. Predicted 1989 defoliation of aspen by the forest tent caterpillar, based on egg-band surveys.

Figure 4. Areas of mountain pine beetle infestations in the Rocky Mountain national parks in 1988.

16 locations. No evidence of DED or its two insect vectors was found in Alberta in 1988.

In **Saskatchewan**, extensive surveys for DED and its bark beetle vectors were continued by the Department of Parks, Recreation and Culture with cooperation from Agriculture Canada's Prairie Farm Rehabilitation Administration (PFRA) and city and town parks departments. No DED-infected trees were found in 1988. Endemic populations of the native elm bark beetle (*Hylurgopinus rufipes* (Eichh.)) were found at several locations in the province. One adult of the smaller Europeon elm bark beetle (*Scolytus multistriatus* (Marsh.)) was found in a pheromone-baited trap in Regina in 1988, but no diseased elm trees were evident[1]. Eight adults of this species were trapped in 1987.

In **Manitoba**, Dutch elm disease (DED) surveys were conducted primarily by the Manitoba Department of Natural Resources and were done with the cooperation of the Canadian Parks Service in Riding Mountain National Park. In the southern part of the province the overall distribution of DED remained much the same as in 1987, although the incidence of hazard and infected trees in most of the native elm stands continued to cause some concern in many locales. In major urban areas, where DED control programs are maintained, the infection incidence remained comparatively low. Less than 1% of the elms in Winnipeg and less than 2% of the elms in Brandon were reported diseased. Most of the infected trees were found along the banks of the Red, Seine, LaSalle, and Assiniboine rivers. One diseased elm tree was confirmed in Virden in 1988. Scattered pockets of diseased trees continued to be reported in wild elm stands along most of the smaller drainage areas in south-central Manitoba, along the Assiniboine River between Winnipeg and Portage la Prairie, and west of Brandon to St. Lazare, where a slight northward expansion was reported. Infections continued to be evident along the Souris River south of Brandon to the United States border.

During 1988, the total identified number of DED-infected trees in Manitoba was 2248, and the total number of hazard and suspect trees scheduled for removal was 17 168[2].

In Riding Mountain National Park, DED is well established in the eastern area and now extends to the park's northern boundary to a point just east of Highway 10.

DWARF MISTLETOE
Arceuthobium americanum Nutt. ex Engelm. on jack and lodgepole pines

In **Alberta**, dwarf mistletoe on lodgepole pine was observed causing considerable mortality in Jasper National Park in the vicinity of Jasper townsite and south of Jasper townsite along Highway 93 to the Sunwapta Falls area.

In **Saskatchewan**, dwarf mistletoe is a widespread parasite of jack pine stands throughout the Mixedwoods Forest Section. The Department of Parks, Recreation and Culture has salvaged unproductive dwarf mistletoe-infested jack pine stands in the Nisbet Provincial Forest for use as firewood. These areas have been scarified and regenerated.

In **Manitoba**, dwarf mistletoe is generally considered the most damaging pest of jack pine, and an intensive management program for this disease has been implemented over the last 5 years. The program has included surveys, research, and sanitation treatment. A comprehensive aerial survey was conducted over approximately 7000 km of jack pine forest within the following Forest Management Units: FMU 23 in the Pineland Forest Section, FMUs 45, 46, and 47 in the Interlake Forest Section, and FMUs 51, 53, 55, 56, and 57 in the Saskatchewan River Forest Section. Research was contracted out to the University of Manitoba Botany Department for two projects: the biology of *A. americanum* on jack pine and the development of a loss simulator model. Sanitation projects included post-logging treatments and thinning and pruning in juvenile stands[3].

YELLOWHEADED SPRUCE SAWFLY
Pikonema alaskensis (Roh.)

The yellowheaded spruce sawfly is increasingly becoming one of the major defoliators of urban ornamental spruce plantings, shelterbelt plantings, and regeneration white spruce in many areas of the region.

---

[1] Personal communication from M. Pandila, Forester, Saskatchewan Department of Parks, Recreation and Culture, Prince Albert, Saskatchewan.

[2] Personal communication from T. Boyce, Forest Protection Officer, Manitoba Department of Natural Resources, Winnipeg, Manitoba.

[3] Knowles, K.; Beaubien, Y.; Vescio, S. 1988. Research and operations: forest protection. Manitoba Forestry Branch situation report to the 1988 North Central Forest Pest Workshop. Manitoba Department of Natural Resources, Forestry Branch, Forest Protection, Winnipeg, Manitoba.

In **Alberta**, moderate-to-severe defoliation of ornamental spruces was common in the following urban centers: Edmonton, Red Deer, Calgary, Medicine Hat, Lethbridge, and Grande Prairie. Similar injury was also prevalent on numerous shelterbelt plantings throughout the central parkland region, in the Edmonton–Camrose–Vegreville triangle, between Vermilion and Lloydminster, and at several locations in the northern half of the province. Light, moderate, and severe defoliation of regeneration roadside spruce was common in some areas of Waterton Lakes, Banff, and Jasper national parks.

In **Saskatchewan**, small pockets of moderate-to-severe defoliation of white spruce were again prevalent near Namekus Lake and along Kingsmere Road in Prince Albert National Park. Similar injury was observed on ornamental spruce plantings and in shelterbelts in and around Shellbrook, Tisdale, Melfort, Saskatoon, Swift Current, and Regina.

In **Manitoba**, moderate-to-severe injury was observed on regeneration spruce along Highway 10 in Riding Mountain National Park, and light-to-moderate injury was evident on spruce plantings in Wasagaming townsite.

In the **Northwest Territories**, light defoliation was reported on regeneration white spruce and on some ornamental white spruce plantings.

LARCH SAWFLY
Pristiphora erichsonii (Htg.)

In **Alberta**, light defoliation was evident in tamarack stands east and west of Rocky Mountain House, near Obed and High Level, near Grimshaw, and north of Athabasca. Some light injury was noted on Siberian larch plantings in Edmonton, Vermilion, and Red Deer.

In the **Northwest Territories**, the larch sawfly was responsible for moderate-to-severe defoliation of tamarack stands along Highway 1 from the vicinity of the Trout River west to the junction of Highway 7. Similar defoliation was observed throughout the Fort Simpson region west to the Franklin Mountains, north to Fort Norman, and at several locations along the Great Bear River and along the South Nahanni River into the lower reaches of Nahanni National Park. Light-to-moderate defoliation was evident in tamarack stands along the Liard River south of Fort Simpson to Nahanni Butte. Light defoliation was noted south of Nahanni to Fort Liard and the British Columbia boundary. Several pockets of light defoliation also occurred along Highway 3 between Fort Providence and Rae.

LARGE ASPEN TORTRIX
Choristoneura conflictana (Wlk.)

In **Alberta**, light-to-moderate injury was reported in the Calgary–Turner Valley–Millarville area and in the Stettler–Drumheller–Lacombe aspen parkland. Endemic populations were present throughout the remainder of the aspen forest that was inspected.

In **Saskatchewan**, the large aspen tortrix was very common throughout most aspen stands in the central part of the province. Scattered pockets of moderate-to-severe defoliation were evident in many areas of the Nisbet Forest northwest of Macdowall. Similar defoliation was present in Duck Mountain Provincial Park, near Togo and Runnymede, south of Macdowall to Rosthern, between Radisson and Langham, and in the Maymont area. Population levels remained low in other areas of the province.

In **Manitoba**, moderate-to-severe defoliation was reported over an estimated 2849 ha in aspen forest west of the Duck Mountains. Light defoliation was generally present in most other aspen areas inspected.

JACK PINE BUDWORM
Choristoneura pinus Free.

Jack pine budworm infestations in Alberta remained at much the same levels as reported in 1987. In Saskatchewan, infestations continued to decline, and in Manitoba populations were reduced to endemic levels.

In **Alberta**, light defoliation persisted in native jack pine stands in the Tawatinaw–Clyde area. No change in the total 70-ha infestation area, reported in 1987, was evident in 1988.

In **Saskatchewan**, defoliation was evident in only a few previously reported infestation areas. Patchy, moderate damage was reported in jack pine regeneration north of Smeaton and along Highway 106 between the Torch River and White Gull Creek. Similar damage was evident in a jack pine plantation and on fringe regeneration east of Prince Albert near Crutwell.

In **Manitoba**, the previously reported outbreak (first reported in 1982) completely collapsed in 1988. Egg-mass samples were collected at 10 permanent plot

locations to predict defoliation for 1989. Light defoliation will probably occur at two locations; no defoliation is predicted in the other eight (Table 5). No egg-mass samples were taken in Alberta or Saskatchewan.

NURSERY PESTS

In **Alberta**, two new potential pests were identified, one causing damage and mortality to potted lodgepole pine seedlings in the greenhouse at the Northern Forestry Centre, and the other causing needle chlorosis in white spruce seedlings at the Pine Ridge Forest Nursery at Smoky Lake. Damage to the lodgepole pine seedlings was caused by the black vine weevil (*Otiorhynchus sulcatus* (F.)), whose larvae feed on the roots. Damage to the spruce foliage was caused by the mite, *Nalepella halourga* Keif., in the family Phytoptidae. This mite is a native species of Canada with a boreal distribution.

In **Manitoba**, the Department of Natural Resources submitted samples of conifer seedlings and soil to the Pacific Forestry Centre for identification of potential disease organisms. Specimens were from the Pineland Provincial Forest Nursery in Hadashville and the Clearwater Provincial Forest Nursery in The Pas. Colonies of *Pythium* and *Fusarium* were identified in most soil samples, but levels of infection did not appear to be high enough to cause concern for seedling mortality. Cultural treatment by tilling in the Pineland nursery appeared to successfully reduce infection levels. Mortality of black spruce seedlings grown at the Clearwater nursery had *Chaetomium* (saprophytic fungi) associated with them, but it was considered secondary to a stressed condition likely induced by environmental factors.

PLANTATION PESTS

A committee with representatives from the three prairie provinces and Forestry Canada was established in 1987 to develop a standardized field survey method suitable for conducting pest surveys in high-value conifer stands within the region. The method provides a means to systematically sample and quantitatively assess plantations and naturally regenerated areas for incidence of damage agents, tree mortality, stem deformities, and other damage effects. The method was revised for the 1988 field season and applied uniformly throughout the region, except in Manitoba where plantations were sampled more intensely.

A total of 124 plantations and other high-value conifer stands, 4–25 years old, were surveyed in 1988 at various locations (Fig. 5). The general characteristics of the stands sampled are summarized by province and territory in Table 6. Lodgepole pine, jack pine, and white spruce were the species studied (Tables 6 and 7). Damage incidence, classified as top kill, stem deformity, or tree mortality, is summarized by tree species and stand age class collectively for the region in Table 7. The various important causal agents contributing to top kill,

Table 5. Jack pine budworm egg-mass density estimates in Manitoba in 1988 and predicted defoliation for 1989

Plot	Plot location	Management unit	Source of data[a]	Avg. no. egg masses per 10 m² foliage	Predicted defoliation for 1989
1	Spruce Woods	04	MDNR	0.6[b]	Light
2	Kettle Hills	11	For. Can.	1.8[c]	Light
3	Sandilands	20	For. Can.	0	Nil
4	Belair	23	For. Can.	0	Nil
5	Manigotagan	31	For. Can.	0	Nil
6	Moose Lake	53	MDNR	0	Nil
7	Reed Lake	60	MDNR	0	Nil
8	Flin Flon	62	MDNR	0	Nil
9	Lynn Lake	71	MDNR	0	Nil
10	Wabowden	83	MDNR	0	Nil

[a] MDNR = Manitoba Department of Natural Resources; For. Can. = Forestry Canada.
[b] Values based on 60-cm branch samples.
[c] Values based on 45-cm branch samples.

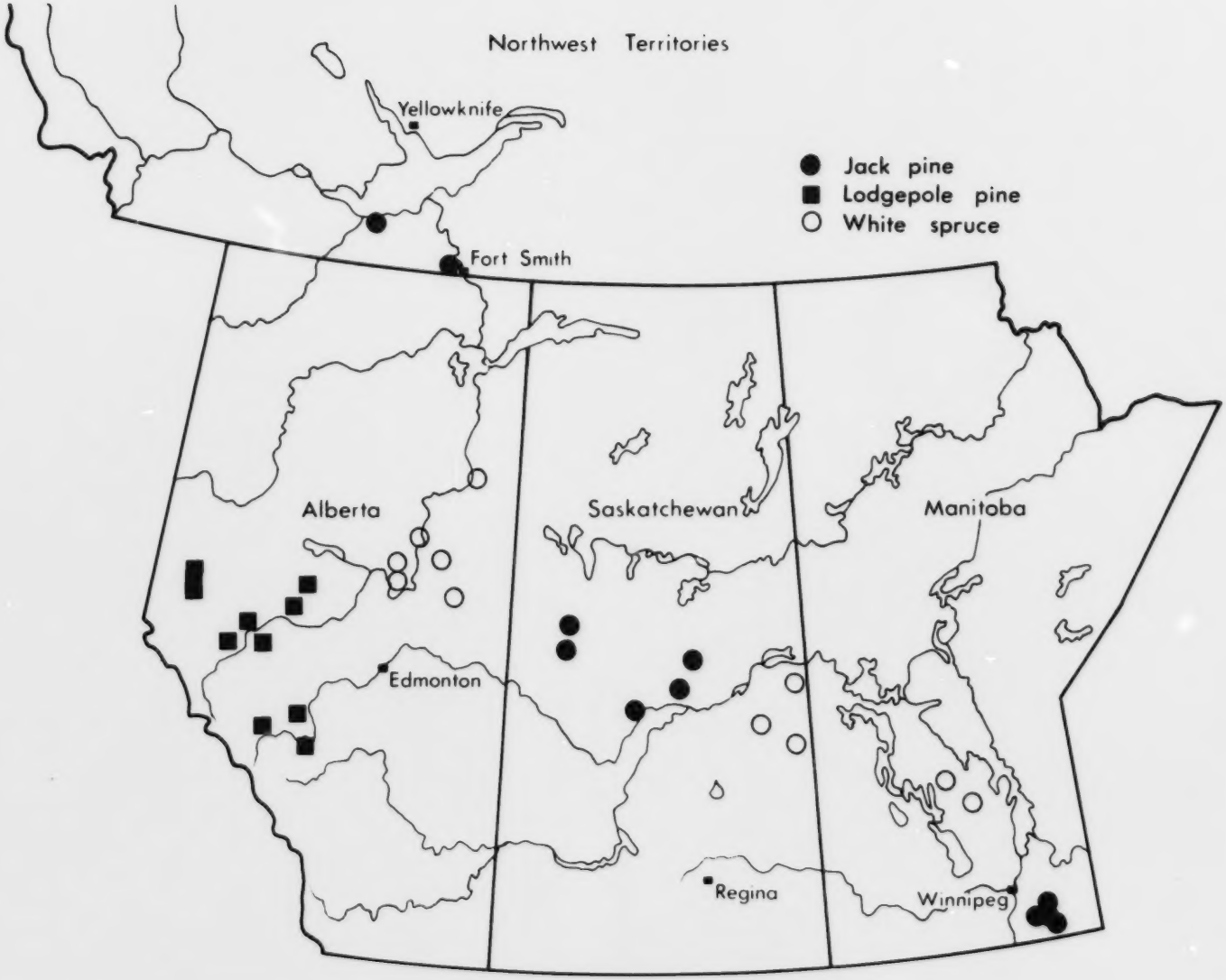

Figure 5. Locations of young high-value conifer stands sampled for pests in 1988.

Table 6. Attributes of stands and plantations sampled for insects, diseases, and other damage agents in 1988

Attributes of stands and plantations	Manitoba	Saskatchewan	Alberta	Northwest Territories
Jack pine				
No. stands and plantations sampled	20	6	—[a]	2
Total area (ha)	921	≥160	—	—
Total no. trees	1855	829	—	1015
Range in stand age	8-25	8-18	—	7-20
Lodgepole pine				
No. stands and plantations sampled	—	—	80	—
Total area (ha)	—	—	≥600	—
Total no. trees	—	—	≥1800	—
Range in stand age	—	—	4-24	—
White spruce				
No. stands and plantations sampled	1	3	12	—
Total area (ha)	65	175	≥300	—
Total no. trees	213	93	1000	—
Range in stand age	21	8-20	6-10	—

[a] No data available.

Table 7. Summary of percentage top-kill, stem deformity, and tree mortality in different stand age classes of jack pine, lodgepole pine, and white spruce stands in Manitoba, Saskatchewan, Alberta, and the Northwest Territories in 1988

Tree damage characteristics (%)	Stand age class (yr)			
	6-10	11-15	16-20	21+
Jack pine stands				
Top kill	1-5	11-15	6-10	≤1
Stem deformity	6-10	6-10	6-10	
Tree mortality	<1	1-5	≤1	≤1
Lodgepole pine stands				
Top kill	1-5	1-5	≤1	≤1
Stem deformity	6-10	1-5	≤1	≤1
Tree mortality	1-5	1-5	1-5	6-10
White spruce stands				
Top kill	21-25	≤1	11-15	—[a]
Stem deformity	1-5	≤1	11-15	—
Tree mortality	≤1	—	—	—

[a] No data available.

stem deformity, and tree mortality are identified in Table 8 with a breakdown by province and territory to indicate regional importance and the general distribution pattern. No attempt is made here to identify specific stands or forest regions where major damage agents were prominent. These will be dealt with elsewhere in more detailed reports.

Across the region, top kill was highly variable and was most severe on white spruce. Animal browse, frost injury, spruce bud midge, and white pine weevil were the important damage agents on this species. Stem deformity, expressed as leaning or severe crookedness of stem, forked top, or top branchiness, generally ranged between 6 and 10%, while tree mortality was usually less than 5%. Armillaria root rot, western gall rust and other pine stem rusts, and the Warren rootcollar weevil were the most important mortality factors of the two pine species.

ACID RAIN MONITORING

The Acid Rain National Early Warning System (ARNEWS) was established in 1984 to detect early signs of acid rain damage to forests. There were twelve permanent sampling plots established in the prairies region: five in Alberta, three in Saskatchewan, and four in Manitoba. These are part of a nationwide network of permanent plots set up to detect and monitor changes in soil, minor vegetation, and tree growth. All ARNEWS plots were examined twice in 1988, once in June and again in late August or in early September, and were monitored for insect, disease, and physiological damage. All basic plot data have been previously completed and forwarded to the Petawawa National Forestry Institute for computer input and summary.

Table 8. Summary of important damage agents causing stem growth, deformity, and mortality in young high-value conifer stands in Manitoba, Saskatchewan, Alberta, and the Northwest Territories

Damage agent	Host			
	Manitoba	Saskatchewan	Alberta	NWT
Animal browse (deer, moose, elk, hare, squirrel)	Jack pine White spruce	Jack pine White spruce	Jack pine Lodgepole pine White spruce	Jack pine
Armillaria root rot *Armillaria ostoyae*	Jack pine	Jack pine White spruce	Lodgepole pine	—[a]
Commandra blister rust *Cronartium commandrae*	Jack pine	—	Jack pine Lodgepole pine	—
Eastern pine shootborer *Eucosma gloriola*	Jack pine	—	—	—
Frost injury	White spruce	White spruce	Lodgepole pine White spruce	—
Improper planting	Jack pine	White spruce	—	—
Jack pine budworm *Choristoneura pinus*	—	Jack pine	—	—
Jack pine shootborer *Rhyacionia granti*	Jack pine	—	—	—
Lodgepole terminal weevil *Pissodes terminalis*	—	Jack pine	Jack pine Lodgepole pine	Jack pine
Pitch nodule makers *Petrova albicapitana* *P. metallica*	Jack pine	Jack pine	Jack pine Lodgepole pine	Jack pine
Spruce bud midge *Rhabdophaga swainei*	—	—	White spruce	—
Stalactiform blister rust *Cronartium coleosporioides*	—	—	Lodgepole pine	—
Warren rootcollar weevil *Hylobius warreni*	—	—	Lodgepole pine	—
Western gall rust *Endocronartium harknessii*	Jack pine	Jack pine	Jack pine Lodgepole pine	Jack pine
White pine weevil *Pissodes strobi*	Jack pine	White spruce	—	—

[a] No data available.

NOTEWORTHY INSECTS, DISEASES, AND OTHER DAMAGE AGENTS

Insect, disease, or damage agent	Host	Location	Remarks
American aspen beetle *Gonioctena americana* (Schaeff.)	Aspen	Alberta Saskatchewan Manitoba	Low populations in many regeneration areas in the region.
Aphids, open-feeding Several species	Many hosts	Alberta NWT	High populations common on native forest regeneration, in plantations, and on urban plantings.
Armillaria root rot *Armillaria ostoyae* (Romag.) Herink	Many hosts	Alberta Saskatchewan Manitoba NWT	Variable degrees of infection noted in most areas inspected. Also present in many plantation sites.
Ash flower gall mite *Aceria fraxiniflora* (Felt)	Green ash	Alberta Saskatchewan Manitoba	Medium population levels noted in many urban plantings and shelterbelts throughout central and southern Alberta; also in localized areas near Lac du Bonnet and McArthur Falls in Manitoba and in Swift Current, Regina, and Moose Jaw in Saskatchewan.
Aspen and poplar leaf and twig blight *Venturia macularis* (Fr.) E. Müller & Arx *Venturia populina* (Vuill.) F.	Aspen Poplar	Alberta Saskatchewan	Various degrees of infection evident on regeneration in both provinces.
Aspen serpentine leafminer *Phyllocnistis populiella* Cham.	Aspen	Alberta Saskatchewan NWT	In Alberta and Saskatchewan, light mining was evident in most aspen stands inspected. Light-to-moderate mining was reported in the NWT in the Camsell Bend area.
Aspen webworms *Tetralopha aplastella* (Hulst.) *Meroptera pravella* (Grt.)	Aspen	Saskatchewan	Low-to-medium populations present in forest tent caterpillar and large aspen tortrix infestation areas. Especially notable in Meadow Lake Provincial Park.

Continued on next page

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Atropellis canker *Atropellis piniphila* (Weir) Lohman & Cash	Lodgepole pine	Alberta Saskatchewan	Infections evident in pine stands in Waterton Lakes National Park, Cypress Hills Provincial Park, along the Trunk Road between Nordegg and the Clearwater Ranger Station, and at several locations in Kananaskis Country.
Birch leaf miners *Fenusa pusilla* (Lep.) *Profenusa thomsoni* (Konow)	Birch species	Alberta Saskatchewan Manitoba	Light, moderate, and severe infestations very common on planted birches in urban areas. Severe mining persisted in some native birch stands examined in Alberta and Saskatchewan. In Manitoba moderate injury was reported in The Pas area.
Black-knot of cherry *Apiosporina morbosa* (Schw.) Arx	May Day tree Choke cherry	Alberta Saskatchewan	Notable infection levels reported on May Day trees in many urban centers. Commonly found on choke cherry in native stands.
Boxelder twig borer *Proteoteras willingana* (Kft).	Manitoba maple	Alberta Saskatchewan	Shoot damage reported on both shelterbelt and urban plantings in many areas.
Bronze birch borer *Agrilus anxius* Gory	Birch species	Alberta Saskatchewan	Generally associated with birch dieback on urban plantings. Samples received from Edmonton, Red Deer, Calgary, Lethbridge, and Saskatoon. Reports of borer damage showed a definite increase in many areas.
Bruce spanworm *Operophtera bruceata* (Hulst)	Aspen	Alberta Manitoba	Pockets of light-to-moderate defoliation noted in the Calgary, Stettler, Drumheller, and Obed areas in Alberta. In Manitoba, moderate injury was reported in the Duck Mountain area.

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Chemical injury from pesticides	Many hosts	Alberta Saskatchewan	Improper application of these agents is continuing to be an ever-increasing problem in many areas of the region.
Clearwing moth *Synanthedon* sp.	Spruce Pine	British Columbia Alberta Saskatchewan	Stem and branch mortality tend to be increasing on mature and overmature trees in urban centers and also in some native forest stands. Especially notable in some localized areas in Kootenay, Banff, and Jasper national parks.
Cottonwood leafmining beetle *Zeugophora scutellaris* Suffr.	Poplar	Alberta Saskatchewan	Light damage reported on hybrid poplars in several areas of southern Alberta. Also noted on plantings on University of Saskatchewan grounds.
Cytospora canker *Cytospora chrysosperma* (Pers.) Fr.	Poplar Mountain-ash	Alberta	Light infection levels common in native stands in most areas that were checked in the province. Especially evident in Whistlers Campground in Jasper National Park. Very common on mountain-ash plantings in urban centers where this species has been predisposed to infection by winter injury.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	British Columbia Alberta	Low populations persist in Jasper National Park near Annette and Patricia lakes and between Jasper townsite and the west gate. Residual populations were evident in the Redstreak Campground area in Kootenay National Park.

Continued on next page

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Early aspen leafroller *Pseudexentera oregonana* Wlsm.	Aspen	Alberta Saskatchewan Manitoba	Light, moderate, and severe leaf rolling in aspen stands between Calgary and Turner Valley and in the Camrose, Hardisty, Red Deer, Lacombe, and Stettler areas in Alberta. In Saskatchewan, light-to-moderate injury occurred between Macdowell and Rosthern, from Langham to Radisson, near Maymont, and in the west and center blocks of Cypress Hills Provincial Park. In Manitoba, light and moderate injury was reported near Sprague and in the Duck Mountains.
Eastern blackheaded budworm *Acleris variana* (Fern.)	Spruce	Alberta Saskatchewan Manitoba	Light defoliation was evident at several locations in Alberta and Saskatchewan. Moderate injury reported on mature spruce in Riding Mountain National Park, Manitoba.
European alder leafminer *Fenusa dohrnii* (Tisch.)	Alder	British Columbia Alberta	Light-to-moderate infestations common in Yoho and Jasper national parks. Some mining noted in Waterton Lakes National Park.
Fall cankerworm *Alsophila pometaria* (Harr.)	Elm Green ash Manitoba maple	Alberta Saskatchewan Manitoba	Continues to cause varying degrees of defoliation in most urban areas such as Lethbridge, Medicine Hat, Swift Current, Regina, Brandon, and Winnipeg.
Fire blight *Erwinia amylovora* (Burr.) Winsl. et al.	Apple Mountain-ash	Alberta	Few reports of infections were received, indicating a probable decline in 1988.

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Flooding	Many species	NWT Alberta	Extensive flood damage was reported in the south Great Slave Lake area and along the Liard River valley in the NWT. As a result of high precipitation and expanding beaver populations, significant losses in commercial forests were evident in the Footner Lake Forest in Alberta.
Gall wasp on oak *Callirhytis* nr. *flavipes* (Gill.)	Bur oak	Alberta	A definite increase in reports received from areas where oak is used for urban plantings. Twig and leaf galls are becoming more prevalent in some urban areas such as Edmonton, Calgary, and Red Deer.
Gray willow leaf beetle *Tricholochmaea decora* (Say)	Willow species	British Columbia Alberta Saskatchewan	Significant skeletonizing injury to willow foliage was evident in Yoho National Park and in the Fort McMurray, Slave Lake, Peace River, and Edson areas in Alberta. In Saskatchewan, low population levels were evident throughout the forested area.
Greenheaded sawfly *Pikonema dimmockii* (Cress.)	Spruce	NWT	Light-to-moderate spruce defoliation reported in the Alexandra and Louise falls campground areas.
Honeysuckle aphid *Hyadaphis tataricae* (Aizen.)	Honeysuckle	Alberta Saskatchewan	Becoming an ever-increasing problem on most honeysuckle species. Causes rosetting and a brooming effect on the foliage of terminal shoots.
Hypoxylon canker *Hypoxylon mammatum* (Wahl.) Miller	Aspen	Alberta Saskatchewan Manitoba	No change from previous seasons. Infections generally common in aspen areas of the region.

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Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Jack pine sawfly *Neodiprion virginianae* complex	Jack pine Lodgepole pine	Alberta Saskatchewan	Low population levels persist in the Chip Lake–Edson area of Alberta and in some areas within the Nesbit Forest in Saskatchewan.
Leaf beetles *Chrysomela* spp.	Aspen Poplar Willow	British Columbia Alberta Saskatchewan	Light, moderate, and severe skeletonizing of poplar and willow very evident in Banff, Jasper, Yoho, Kootenay, and Waterton Lakes national parks. Low population levels were reported in Cypress Hills Provincial Park in Saskatchewan.
Leaf gall of aspen *Aceria* nr. *dispar* (Nal.)	Aspen	Alberta	Moderate-to-severe infestations common in the central part of the province; especially notable in Elk Island National Park and in Cross Lake and Whitney Lakes provincial parks.
Leaf rust *Melampsora medusae* Thuem.	Aspen Poplar	Alberta Saskatchewan	High incidence of rust infections were evident in native aspen stands in many areas of central and northern Alberta. In Saskatchewan it was reported in the Pasquia and Porcupine hills and in the Glaslyn and Meadow Lake Provincial Park areas. Low and medium infection levels were evident on both hosts in Waterton Lakes, Banff, and Jasper national parks.
Linden looper *Erannis tiliaria* (Harr.)	Birch Hazel Manitoba maple Aspen	Alberta Manitoba	Moderate-to-severe defoliation was evident in Manitoba in Turtle Mountain Provincial Park and in Riding Mountain National Park. In Alberta, low populations were noted near Drumheller, Medicine Hat, Lethbridge, and Calgary.

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Lodgepole needleminer *Coleotechnites starki* (Free.)	Lodgepole pine	Alberta Saskatchewan	In Alberta, medium-to-high population levels of early instar larvae were evident in Banff National Park between Saskatchewan Crossing and the Weeping Wall area. Low populations were collected on Mt. Norquay and in Banff townsite. In Saskatchewan, light mining of needles was evident in some pine areas of Cypress Hills Provincial Park.
Lodgepole pine beetle *Dendroctonus murrayanae* Hopk.	Lodgepole pine Jack pine	Alberta Saskatchewan Manitoba	This species of bark beetle was collected in Banff and Jasper national parks, near Blue Ridge, and on jack pine in the Pine Ridge Forest Nursery near Smoky Lake. Low population levels were observed in Cypress Hills Provincial Park in Saskatchewan. In Manitoba, collections were made near Thompson.
Lodgepole terminal weevil *Pissodes terminalis* Hopping	Jack pine Lodgepole pine	Alberta Saskatchewan Manitoba	Light incidence commonly found throughout the region.
Needle rust of fir *Pucciniastrum epilobii* Otth.	Fir	Alberta	In Waterton Lakes National Park severe injury to young regeneration fir was evident along the Cameron Lake Road. Light injury was common on fir in several other areas of the park.
Nelson's juniper rust *Gymnosporangium nelsonii* Arth.	Juniper Saskatoon	British Columbia Alberta Saskatchewan	Fairly high incidence of this rust reported in the following areas: Canmore, Kananaskis Country, Hinton, North Battleford, in Redstreak Campground in Kootenay National Park, near Johnston Canyon in Banff National Park, near Field in Yoho National Park, and between Jasper and the east gate in Jasper National Park.

Continued on next page

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Northern pitch twig moth *Petrova albicapitana* (Bsk.)	Lodgepole pine Jack pine	Alberta Saskatchewan Manitoba NWT	Light damage to natural regeneration stands and in some plantation sites in the region.
Northern tent caterpillar *Malacosoma californicum pluviale* (Dyar)	Poplar Willow Pin cherry	Alberta NWT	Light, moderate, and severe defoliation reported from several areas in Alberta. In the NWT, several colonies were reported on willow in Norman Wells.
Pear sawfly *Calira cerasi* (L.)	Mountain-ash Cotoneaster Hawthorn Plum	Alberta Saskatchewan	Moderate-to-severe defoliation of hawthorn reported in Fort McMurray and High Level. Elsewhere a general decline was evident throughout areas that were inspected.
Pine needle casts *Elytroderma deformans* (Weir) Darker *Lophodermella concolor* (Dearn.) Darker *Davisomycella ampla* (Davis) Darker	Jack pine Lodgepole pine	Alberta Saskatchewan Manitoba	Low incidences of infections of *E. deformans* and *L. concolor* were found in pine stands throughout most of the foothills area in Alberta and in the Rocky Mountain national parks. In Saskatchewan, *L. concolor* was reported in the west block of Cypress Hills Provincial Park. *D. ampla* was reported in some pine plantation sites in Manitoba.
Pine needle rust *Coleosporium asterum* (Dietz) Syd.	Lodgepole pine Jack pine	Alberta Saskatchewan Manitoba	Light-to-moderate infections common in lodgepole pine stands in many areas of the foothills and national parks regions in Alberta. Reported in jack pine stands and plantation sites in Saskatchewan and Manitoba.

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Pine needle scale *Chionaspis pinifoliae* (Fitch)	Spruce Pine	Alberta Saskatchewan Manitoba	Medium and high population levels reported in Alberta in most of the forested area inspected. In Saskatchewan, low-to-medium populations were evident in old Forestry Canada plantation sites near Mortlach and Borden and in some areas in Cypress Hills Provincial Park. In Manitoba, low populations were noted in the Gypsumville area.
Pinewood nematode *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle	Balsam fir	Alberta	Confirmed specimens taken from dying balsam fir in Sir Winston Churchill Provincial Park near Lac La Biche. No other reports received in 1988.
Poplar borer *Saperda calcarata* Say	Aspen Balsam poplar	Alberta Saskatchewan NWT	Larval activity is common in native aspen stands in many areas in both provinces and is becoming an ever-increasing problem in acreage sites that are encroaching onto native aspen stands. Infested trees found in riverside balsam poplar stands in some areas of the NWT.
Poplar leafminer *Phyllonorycter* nr. *salicifoliella*	Aspen	British Columbia Alberta Saskatchewan Manitoba	Common occurrence in Yoho, Kootenay, Jasper, and Riding Mountain national parks, Duck Mountain Provincial Park, and the Northwest Angle Provincial Forest. Present in varying degrees in most forested areas inspected.

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Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Porcupine	Lodgepole pine Jack pine Scots pine	Alberta Manitoba	Porcupine feeding was responsible for considerable top kill in pine stands in many areas of the national parks in Alberta. In Manitoba, damage was reported on Scots pine in the Spruce Woods area and in some jack pine plantation sites southeast of Winnipeg.
Septoria canker *Mycosphaerella populicola* G.E. Thompson	Poplar	Alberta NWT	Canker infections on branches and stems commonly found in hybrid shelterbelts and in plantations in the central part of Alberta. In the NWT, medium-to-high infection levels were reported along the Liard River in the vicinity of Fort Liard.
Shot-hole of cherry *Coccomyces hiemalis* Higgins	Choke cherry	Alberta	Shot-hole injury was very common on urban plantings in many areas of the province.
Silverleaf *Chondrostereum purpureum* (Pers.: Fr.) Pouzar)	Cotoneaster Mountain-ash Nanking cherry Plum	Alberta	A slight increase in infection levels reported during 1988.
Snowshoe hare	Lodgepole pine Jack pine	Alberta	Light and moderate injury reported on both tree species in many areas in northern Alberta.
Spittlebug *Aphrophora* sp.	Jack pine	Manitoba	Low populations evident in Whiteshell Provincial Park.
Spruce bud midge *Rabdophaga swainei* Felt	Spruce	Alberta Saskatchewan NWT	Rosetting common in some regeneration areas that were inspected.
Spruce gall aphids *Adelges* spp. *Pineus* spp.	Spruce Douglas-fir Lodgepole pine	Alberta Saskatchewan NWT	Common where most of the host trees appear. Especially notable on urban plantings.

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Spruce needle cast *Lirula macrospora* (Htg.) Darker	Spruce	British Columbia Alberta	Low-to-medium infections reported in several areas of the Alberta foothills and in Kananaskis Country. Light infection levels noted in Waterton, Yoho, Banff, and Jasper national parks.
Spruce needle rust *Chrysomyxa* spp.	Spruce	Alberta Saskatchewan NWT	Medium-to-high infection levels reported in many areas of northern Alberta and in the NWT. Similar infection levels reported in native spruce stands in the Big River–St. Walburg areas in Saskatchewan. Low infection levels reported in the Rocky Mountain national parks.
Spruce spider mite *Oligonychus ununguis* (Jac.)	Spruce Juniper Cedar	Alberta Saskatchewan	Continues to be a major problem in urban plantings and in some farm shelterbelts.
Squirrel	Lodgepole pine Jack pine	Alberta Manitoba	Branch flagging injury was common in the Rocky Mountain national parks. In Manitoba, reports of injury were received from the Jenpeg and Suwannee River areas.
Stalactiform blister rust *Cronartium coleosporioides* Arth.	Lodgepole pine Jack pine	Alberta Manitoba	Infections common on lodgepole pine in the following areas: Saskatchewan Crossing in Banff National Park, Athabasca Falls in Jasper National Park, along the Cameron Lake Road in Waterton Lakes National Park, and in Kananaskis Country. Infections reported in jack pine plantation sites in Manitoba.
Two-year-cycle spruce budworm *Choristoneura biennis* Free.	Spruce	British Columbia	Light damage evident in the Numa Creek area of Kootenay National Park and near Emerald Lake in Yoho National Park.

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Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Ugly-nest caterpillar *Archips cerasivorana* (Fitch)	Choke cherry	Alberta Saskatchewan Manitoba	Tents common in southern Alberta, near Macdowall and the Battlefords in Saskatchewan, and in the Spruce Woods area in Manitoba.
Western ash bark beetle *Hylesinus californicus* (Swaine)	Green ash	Alberta Saskatchewan	Causing some concern and considerable branch mortality in the following areas: Calgary, Medicine Hat, Lethbridge, and Drumheller in Alberta. In Saskatchewan, light infestations were reported in Saskatoon, Regina, and Swift Current.
Western gall rust *Endocronartium harknessii* (J.P. Moore) Y.Hirat.	Lodgepole pine Jack pine Scots pine	Alberta Saskatchewan Manitoba NWT	Stem and branch galls common in many areas. New infections reported on Scots pine in Alberta.
White pine weevil *Pissodes strobi* (Peck)	Spruce Jack pine	Alberta Saskatchewan Manitoba	An increase in reports of injury reported from many areas in the region. Becoming more prevalent in plantation sites and on urban plantings. Light injury reported in the Rocky Mountain national parks.
Willow leafminer *Micrurapteryx salicifoliella* (Cham.)	Willow	Alberta Saskatchewan NWT	Varying degrees of injury noted along the Slave and Liard rivers in the NWT and along many watercourses throughout northern Alberta. Light injury was common on the host species in central and northern Saskatchewan.

Noteworthy insects, diseases, and other damage agents, continued

Insect, disease, or damage agent	Host	Location	Remarks
Wind	Several species	Alberta Saskatchewan Manitoba	Blowdown of trees as a result of tornados and very high winds reported in the Gimli, Pine Falls, and Winnipeg areas of Manitoba. In Saskatchewan, blowdown was evident in a jack pine plantation site in Cypress Hills Provincial Park. In Alberta, some blowdown was evident in aspen stands in Kananaskis Country and in Waterton Lakes National Park.
Yellow witches' broom *Chrysomyxa arctostaphyli* Dietz	Spruce	Alberta Saskatchewan	Becoming very common in mature stands of spruce in several areas of both provinces.